

## 2.2

## Equations for Linear Relationships

**C**ars and trucks are an important part of American life and culture. There are nearly 200 million licensed drivers and 140 million registered passenger cars in the United States. To help people keep their cars clean, many cities have self-service car washes.

At most self-service car washes, the charge for washing a car and the company's profit depend on the time the customer spends using the car wash. To run such a business efficiently, it helps to have equations relating these key variables.



## Getting Ready for Problem 2.2

- Sudzo Wash and Wax charges customers \$0.75 per minute to wash a car. Write an equation that relates the total charge  $c$  to the amount of time  $t$  in minutes.
- Pat's Power Wash charges \$2.00 per car to cover the cost of cleaning supplies, plus \$0.49 per minute for the use of water sprayers and vacuums. Write an equation for the total charge  $c$  for any car-wash time  $t$ .
- U-Wash-It charges \$10 for each car. The business owners estimate that it costs them \$0.60 per minute to provide soap, water, and vacuums for a car. Write an equation for the profit  $p$  U-Wash-It earns if a customer spends  $t$  minutes washing a car.
- Explain what the numbers and variables in each equation represent.
- What questions can your equations help you answer?

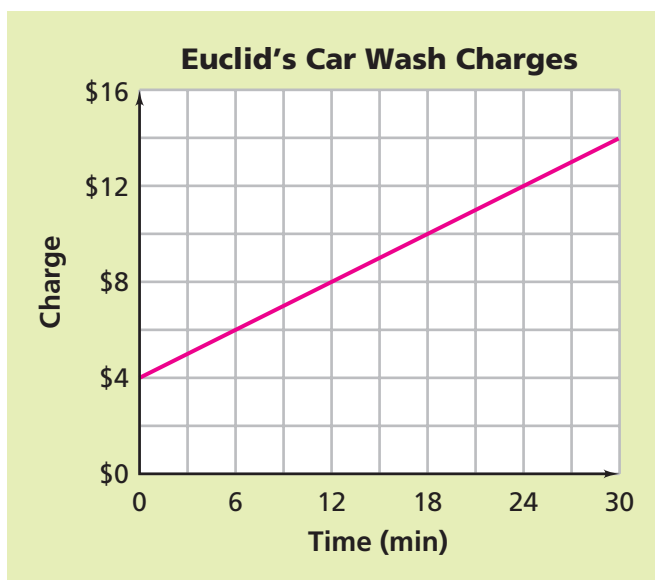
## Problem 2.2 Equations for Linear Relationships

- A. The Squeaky Clean Car Wash charges by the minute. This table shows the charges for several different times.

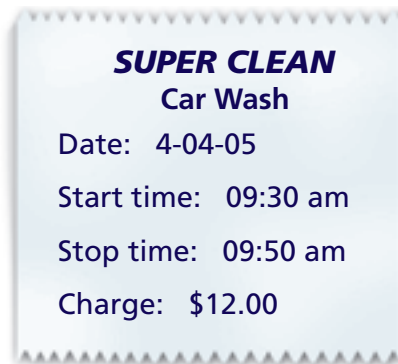
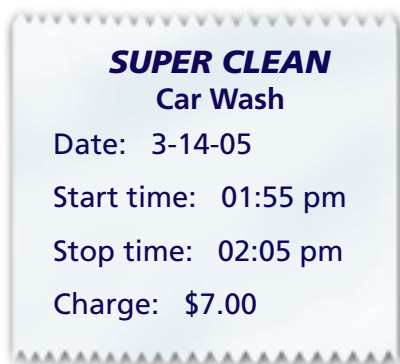
**Squeaky Clean Car Wash Charges**

Time (min)	5	10	15	20	25
Charge	\$8	\$13	\$18	\$23	\$28

1. Explain how you know the relationship is linear.
  2. What are the slope and y-intercept of the line that represents the data?
  3. Write an equation relating charge  $c$  to time  $t$  in minutes.
- B. Euclid's Car Wash displays its charges as a graph. Write an equation for the charge plan at Euclid's. Describe what the variables and numbers in your equation tell you about the situation.



- C. Below are two receipts from Super Clean Car Wash. Assume the relationship between charge  $c$  and time used  $t$  is linear.



1. Each receipt represents a point  $(t, c)$  on the line. Find the coordinates of the two points.
  2. What are the slope and y-intercept of the line?
  3. Write an equation relating  $c$  and  $t$ .
- D. Write an equation for the line with slope  $-3$  that passes through the point  $(4, 3)$ .
- E. Write an equation for the line with points  $(4, 5)$  and  $(6, 9)$ .
- F. Suppose you want to write an equation of the form  $y = mx + b$  to represent a linear relationship. What is your strategy if you are given
1. a description of the relationship in words?
  2. two or more  $(x, y)$  values or a table of  $(x, y)$  values?
  3. a graph showing points with coordinates?

**ACE** Homework starts on page 33.